What is claimed is:

Sub B3

1. A method of plasma etching a layer of dielectric material having a dielectric constant that is greater than 4 comprising the steps of:

exposing said dielectric material layer to a plasma comprising a reducing gas and a halogen containing gas.

2. The method of claim 1 wherein the dielectric material is at least one of HfO_2, ZrO_2, Al_2O_3, BST, PZK, $ZrSiO_2$, $HfSiO_2$, and TaO_2

3. The method of claim 1 wherein the dielectric material is HfO_2.

4. The method of claim 1 wherein the halogen containing gas comprises a chlorine containing gas.

5. The method of claim 1 wherein the reducing gas comprises carbon monoxide.

6. The method of claim 1 wherein halogen gas comprises chlorine and the reducing gas comprises carbon monoxide.

7. The method of claim 4 wherein said chlorine containing gas is Cl_2.

8. The method of claim 6 wherein said exposing step further comprises the step of:

supplying 20 to 300 sccm of Cl_2 and 2 to 200 sccm of CO.

9. The method of claim 1 further comprising the step of:

maintaining a gas pressure of between 2-100 mTorr.

10. The method of claim 6 further comprising the step of:

maintaining a gas pressure of 4 mTorr.

11. The method of claim 1 further comprising the step of:

applying a bias power to a cathode electrode of 5 to

100 W.

12. The method of claim 6 further comprising the step of:

applying a bias power to a cathode electrode of 20 W.

13. The method of claim 1 further comprising the step of:

applying an inductive source power to an inductively coupled antenna of 200 to 2500 W.

14. The method of claim 6 further comprising the step of:

applying an inductive source power to an inductively coupled antenna of 1100 W.

15. The method of claim 1 further comprising the step of:

maintaining a workpiece containing said hafnium-oxide layer at a temperature between 100 to 500 degrees Celsius.

16. The method of claim 6 further comprising the step of:

maintaining a workpiece containing said hafnium-oxide layer at a temperature of 350 degrees Celsius.

17. A method for plasma etching a workpiece having a layer of hafnium-oxide comprising the steps of:

supplying between 20 to 300 sccm of chlorine and between 2 to 200 sccm of carbon monoxide;

maintaining a gas pressure of between 2-100 mTorr;

applying a bias power to a cathode electrode of between 5 to 100 W;

applying power to an inductively coupled antenna of between 200 to 2500 W to produce a plasma containing said chlorine gas and said sulfur dioxide gas;

maintaining said workpiece at a temperature between 100 and 500 degrees Celsius.

18. A computer-readable medium containing software that when executed by a computer causes an etch reactor to plasma etch a layer of dielectric material having a dielectric constant that is greater than 4 using a method comprising:

exposing said dielectric material layer to a plasma comprising a reducing gas and a halogen containing gas.

19. A computer-readable medium of claim 18 wherein the dielectric material is at least one of HfO_2, ZrO_2, Al_2O_3, BST, PZK, $ZrSiO_2$, $HfSiO_2$, and TaO_2

20. A computer-readable medium of claim 18 wherein the dielectric material is HfO_2.

21. A computer-readable medium of claim 18 wherein the halogen containing gas comprises a chlorine containing gas.

22. A computer-readable medium of claim 18 wherein the reducing gas comprises carbon monoxide.

23. A computer-readable medium of claim 18 wherein halogen gas comprises chlorine and the reducing gas comprises carbon monoxide.

27. A computer-readable medium of claim 21 wherein said chlorine containing gas is Cl_2.

25. A computer-readable medium of claim 23 wherein said exposing step further comprises the step of:

supplying 20 to 300 sccm of Cl_2 and 2 to 200 sccm of CO.

26. A computer-readable medium of claim 18 further comprising the step of:

maintaining a gas pressure of between 2-100 mTorr.

27. A computer-readable medium of claim 23 further comprising the step of:

maintaining a gas pressure of 4 mTorr.

28. A computer-readable medium of claim 18 further comprising the step of:

applying a bias power to a cathode electrode of 5 to 100 W.

29. The method of claim 23 further comprising the step of:

applying a bias power to a cathode electrode of 20 W.

30. A computer-readable medium of claim 18 further comprising the step of:

applying an inductive source power to an inductively coupled antenna of 200 to 2500 W.

31. A computer-readable medium of claim 23 further comprising the step of:

applying an inductive source power to an inductively coupled antenna of 1100 W.

32. A computer-readable medium of claim 18 further comprising the step of:

maintaining a workpiece containing said hafnium-oxide layer at a temperature between 100 to 500 degrees Celsius.

33. A computer-readable medium of claim 23 further comprising the step of:

maintaining a workpiece containing said hafnium-oxide layer at a temperature of 350 degrees Celsius.

34. A computer-readable medium containing software that when executed by a computer causes a etch reactor to plasma etch a workpiece having a layer of hafnium-oxide using a method comprising:

supplying between 20 to 300 sccm of chlorine and between 2 to 200 sccm of carbon monoxide;

maintaining a gas pressure of between 2-100 mTorr;

applying a bias power to a cathode electrode of between 5 to 100 W;

applying power to an inductively coupled antenna of between 200 to 2500 W to produce a plasma containing said chlorine gas and said sulfur dioxide gas;

maintaining said workpiece at a temperature between 100 and 500 degrees Celsius.